



## Hazards of Hydrolysate

The Newport Chemical Agent Disposal Facility (NECDF) has been designed and constructed to destroy safely more than 1,200 tons of liquid nerve agent VX currently stockpiled at the Newport Chemical Depot (NECD) in Newport, Indiana. The NECDF will use a chemical neutralization process called caustic hydrolysis where VX (8-33 percent by weight) will be mixed and then heated in a reactor with sodium hydroxide and water. The byproduct of the neutralization process is an organic-salt wastewater called hydrolysate. This hydrolysate will require additional treatment before final disposal. The Army's preferred option for final disposition of the hydrolysate is transportation to a permitted commercial hazardous waste facility where it will undergo additional treatment before final disposal.

The Army has made a commitment to the public that hydrolysate will not leave the NECDF until it is confirmed that the hydrolysate is non-detect for VX, with a Method Detection Limit of less than or equal to 20 parts per billion.

The following paragraphs describe the expected hazards associated with hydrolysate.

### FLAMMABILITY

The flammability hazard associated with hydrolysate, produced at a 33 percent agent loading, relates to the presence of an organic upper layer with a flashpoint of 127 degrees Fahrenheit. The flashpoint is the temperature to which a liquid must be heated before the vapors from the liquid will ignite in the presence of an ignition source (e.g., flame, spark, etc.). The flashpoint for 33 percent loading hydrolysate is similar to that of acetic acid, a major component in vinegar. The upper layer corresponds to approximately 3 to 5 percent (by volume) of the total hydrolysate. However, under the current expected operation conditions in which less VX will be neutralized per hydrolysate batch (8-16 percent agent loading by weight), testing has shown that the flammability is eliminated.

### CORROSIVENESS

Excess sodium hydroxide is present at approximately 3 to 5 percent by weight in the neutralization waste (hydrolysate). (NOTE: 50 percent sodium hydroxide is commonly shipped throughout the United States daily.) Dermal (skin) contact hazards (chemical burns) are the greatest risk of hydrolysate because of the caustic nature of the sodium hydroxide.

### TOXICITY

The neutralization of VX results in breakdown products that include the sodium salts of EA 2192, EMPA, MPA, and thiolamine. In their pure form, and by themselves, these individual compounds possess their own toxicities.

However, in order to get a true picture of the toxicity of a solution like hydrolysate that is made up of these various compounds, it is necessary that toxicity studies be performed on the hydrolysate itself in order to determine the overall effect of the combination of these compounds. That is why, as part of the overall development program, the Project Manager for Alternative Technologies and Approaches evaluated the toxicity of hydrolysate as a whole. These tests were performed with the original 33 percent agent loading neutralization process.

The dermal (skin) and oral toxicity of hydrolysate was evaluated in February 1999 according to Department of Transportation Test Procedures. This testing established that hydrolysate did not qualify as a poison and that it was highly corrosive and capable of damaging skin and producing gastrointestinal injury, as would be expected for any similar caustic solutions.

With the implementation of a reduced agent loading (8-16 percent) neutralization process, except with respect to caustic, the concentrations of all other reaction byproducts will be from 2 to 4 times less than in the hydrolysate (33 percent agent loaded) tested and discussed above. This reduction in the relative contribution of the reaction byproducts will diminish substantially the hazards posed by exposure to hydrolysate.

For more information,  
contact the  
Public Outreach and  
Information Office of the  
Chemical Materials  
Agency  
1(800) 488-0648 or  
[www.cma.army.mil](http://www.cma.army.mil)

or visit the  
Newport Chemical  
Stockpile  
Outreach Office  
P.O. Box 279  
140 South Main Street  
Newport, Indiana 47966  
Phone: (765) 492-4445  
Fax: (765) 492-4475



## Hazards of Hydrolysate (continued)

### CONCLUSION

The Army, as part of the development program, had oral and dermal (skin) toxicity studies performed on the hydrolysate. The key findings were that the hydrolysate no longer exhibited any agent characteristics. In fact, the toxicity and hazard of the hydrolysate were found to be directly related to the corrosive nature of the solution, as would be expected for any similar caustic solutions.

In addition, it must be emphasized that oral exposure is the least likely exposure pathway for hydrolysate—no one is going to drink hydrolysate. With respect to dermal (skin) contact hazards, the major hazard

associated with hydrolysate is its' residual caustic concentration. This property makes hydrolysate extremely corrosive to the skin and could result in severe skin burns. There is a skunky odor associated with hydrolysate. This characteristic odor, though unpleasant, is not a hazard. Therefore, as consistently stated by the Army throughout the life of the project, the caustic/corrosive nature of the hydrolysate poses the most significant hazard. Consequently, splash protection (e.g., gloves, boots, protective clothing, etc.) and respiratory protection (i.e., self-contained breathing apparatus) from caustic vapors is needed when handling hydrolysate.